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Between the high plateaux and mountains of China and Mongolia to the east and the Volga to the west extend the lowlands of Central Asia with their scanty rivers, which either disappear into the sand, or feed the inland Aral and Caspian seas from which their waters evaporate. Two large rivers flow into the Aral Sea. The Syr Darya collects its waters from the western parts of the Tien Shan mountains, and after traversing 1,500 miles, 850 miles of which are navigable, empties into the north-eastern corner of the Aral Sea, its tributaries watering Tashkent en route. The Syr Darya has been called the "Nile of Turkestan", and carries 3.5 cubic miles of water annually (about six times the flow of the Thames). The Amu Darya arises from the Pamirs to the south, and flows north-westward to the southern end of the Aral Sea. Its annual flow is 10.5 cubic miles. The Amu Darya is believed to have changed its course three times since A.D. 600. A branch of the Amu Darya, the Uzboi River, at one time separated off south of the Aral Sea, and traversed about 600 miles of the Turkmenian Plain to empty

into the Caspian, forming a delta at Krasnovodsk (see end-paper map).

Archaeological evidence shows that in the third to fourth millennium B.C., Turkmenia supported a civilization resembling that existing in the South Ukraine and North Crimea. Old irrigation channels have been found which formerly ran from this Usbei River. With the disappearance of the river and the influx of sand, the Kara Kum desert replaced the earlier cultivation, and is now the largest and driest desert in Central Asia.

The average July temperature is 77° to 80°F., rising on some days to 112°. This region, together with parts of India, represent the largest Asian areas of great heat in summer, while the January temperatures are 16° to 32°F. Between the Amu and the Syr Darya rivers the Kyzyl Kum desert also shows the ruins of ancient cities, and here are valleys which were once flooded for rice.

Already in the eighteenth century the Russians were considering the deflection of the Amu Darya once more towards the Caspian Sea. In the summer of 1950 a decree was issued for the irrigation of Turkmenia, and work is now in progress on the building of the main Turkmenian Canal which will link the Amu Darya River with the Caspian Sea.

By 1957 a main canal, 683 miles long, will run to Krasnovodsk, its middle section utilizing the old bed of the Uzboi River; and 746 miles of branch canals are to be completed, together with three main hydro-electric stations, one near Takhia Tash on the left bank of the Amu Darya and the others along the canal. Their aggregate capacity will be 100,000 kilowatts. and the area to be irrigated is about 20,501,000 acres, an area 1. Sanitized Copy Approved for Release 2011/09/15 : CIA-RDP07-02247R000200190002-8 ed land

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will be irrigated for crops, and 17,000,000 acres of pasture land will be periodically flooded. The average daily flow of the main canal will be 6,500 million gallons (four times that of the Thames), but the canal at times will take nearly double that flow. All its water will be used for irrigation and none will pass on to the Caspian Sea. About 47½ per cent of the water of the Amu Darya is to be diverted.

The construction of such a canal through desert presents many problems. In the summer of 1951 an experimental scientific base was established in the desert, with its own railway line and feed canal to supply water for 300 scientists, for hydraulic machinery and for the local growing of crops. A large-scale photo-survey has been made from the air, besides ground surveying, to determine the most favourable position for

the canal and for the location of natural building material. The middle sector of the main canal will utilize the old bed of the dried-up Uzboi River, and the eastern sector of the canal will by-pass the Sarikamish depression, which would take twenty years to fill with water. The whole of the Kara Kum desert region is being studied intensively by scientists drawn from all over the Soviet Union, from Tashkent and Ashkhabad as well as from Moscow. Much survey work has still to be done, and equipment for drilling and other purposes supplies small expeditions of about fourteen workers. They are determining the subsoil water levels, the salinity of this water and the rates of seepage. Building materials and machines are arriving near Takhia Tash, the new landing place on the Amu Darya, where a town is being founded, and equipment for the other end of the canal is accumulating at the seaport of Krasnovodsk.

A major problem concerns preventing seepage through the bed of the canal. This may lead to excessive water loss, but also to the raising of saline subsoil waters to a level which would interfere with the growth of cotton and other crops to be planted near the canal. The lining of such a canal with concrete or asphalt throughout would be too expensive, and clay is to be used for packing and for introduction with the water, which is anticipated will prevent such seepage.

Not only are there the engineering problems in the construction of such a canal, but there are those of maintenance. The silt content of the canal water will probably reach 20 to 25 million tons, and deposition of silt will need continuous control by electric suction machines and dredgers. The intense rate of evaporation of water means that a very large volume of water must pour into the canal. In Lake Sevan in Armenia

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leaves it by the river. Such a rate of evaporation may tend to make the canal water saline. Then blown sand must be prevented from choking the canal.

The problem of silt is being tackled on a large-scale by the All-Union Scientific Research Institute for Hydro-technique and Amelioration. It has devised a floating installation to keep water clean in irrigation channels. A system of stream directing shields allows only pure water to enter a canal. An installation of this type has been set up in one of the largest of the canals in Uzbekistan, and in one year it retained 560,000 cubic yards of silt. The cost of cleaning out the canal was reduced to one-tenth of its previous figure.

Problems connected with salt affect much of the desert republics of Central Asia, deposits being left as their scanty waters evaporate. In the Uzboi river-bed, for example, the deposits are 5 to 10 feet thick in parts. Scientific work is now in progress with a view to making recommendations for the prevention of the main Turkmenian Canal from becoming salt.

The movement of sand is being attacked in several ways. The planting of the first forest belts along the main canal will start in 1952, and all irrigated land will be similarly sheltered against winds, which at times reach hurricane force. Trees are to be planted over a 1½ million acres, but unlike the steppe forests, they must be irrigated. Oak is of course unsuitable for a hot desert, and in 1951 the Ministry of Forestry started collecting seeds of saksaul for planting. The black saksaul and poplar grow well under these conditions, and white acacia, apricot and mulberry will be extensively used.

The surface of the sand can be immobilized by spraying with a by-product from industry, which does not appear to be harmful to plants and can be readily perforated by their growth and by rain. It is planned to treat large sandy areas in this way, and not only prevent the sand blowing into the canal, but stop reclaimed land being smothered once more by sand. The difficulties raised by sand storms are also the subjects of much scientific research at the moment.

Then arises problems, both in Turkmenia and elsewhere, as how best to use the land which will be watered. This depends on the nature of the soil and on the manner in which it

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periods of one to three months, and will support Karakul sheep and horses. Workers from the Byelorussian Institute for the Amelioration of Water and Marshes Economy are engaged on these problems, and have established which plants can most suitably be grown on such meadows to provide fodder for livestock. The work of the many biological expeditions in the Kara Kum deserts and elsewhere is considered in the next chapter.

In the neighbourhood of the lower Amu Darya 2 million acres of rich land will be irrigated and another million on the South Caspian flats. It is anticipated that after 1957 two crops of wheat a year will be harvested, and rice, cotton, olives, dates, grapes and other fruit and plants producing rubber and essential oils, will be raised. A decrease in the level of the Aral Sea will follow the diversion of so much water

into the Turkmenian Canal. The consequent reduction of subsoil water-level in the delta of the Amu Darya will provide additional areas of rich arable land.

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